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THESIS

A QUANTITATIVE ANALYSIS OF FACTORS AFFECTING RETENTION OF FEMALE AVIATORS IN U.S. NAVAL AVIATION

by

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September 2012

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A QUANTITATIVE ANALYSIS OF FACTORS AFFECTING RETENTION OF FEMALE AVIATORS IN US NAVAL AVIATION

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ABSTRACT

This study builds upon past research involving turnover among military women to develop a statistical model for active duty Female Naval Aviator (FNA) retention. A data set from Defense Manpower Data Center, which included FNAs from year groups 1989 to 1998 was analyzed to determine the impact of organizational, career, and personal factors on retention. Review of pertinent literature revealed that personal, organizational and job factors unique to a FNA might have some impact on the retention decision. A logistical regression analysis determined that both number of dependents and age were statistically significant in predicting whether a FNA would stay in or leave active duty operational naval aviation (ADONA). The findings of this study could indicate that FNAs who desire to have children leave ADONA status earlier. Successful implementation of a continuous survey tool, such as the previous ARGUS survey, could better determine the true reasons behind a service member's choice to leave the Navy.

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LIST OF ACRONYMS AND ABBREVIATIONS

ADONA	Active Duty Operational Naval Aviation
ATC	Air Traffic Controller
DMDC	Defense Manpower Data Center
FNA	Female Naval Aviator
NAE	Naval Aviation Enterprise
PMOS	Primary Military Occupational Specialty

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EXECUTIVE SUMMARY

This study builds upon past research involving turnover among military women to develop a statistical model for active duty Female Naval Aviator (FNA) retention. Since the Department of Defense adopted the policy of an all-volunteer force, retention of personnel has been an issue of concern to both strategic force planners and high-level operational personnel (Janowitz & Moskos, 1979). FNA promotion and retention within the Naval Aviation Enterprise (NAE) were noted as areas of concern in the September 2008 Chief of Naval Operations (CNO) Diversity Accountability Review, and the retention concern is even more prominent after initial service obligation completion. The problem is to determine which factors most influence FNAs to leave.

Turnover is a term that encompasses employees who have left an organization for any reason and must be replaced (Mathis & Jackson, 2008). Turnover research has revealed three broad categories that appear to drive turnover: external, work related and personal factors. These categories appear in various forms in work from several different researchers (Martin, 1979; Glass & Riley, 1998; Mathews, Collins, & Cobb, 1974; Cropsey, et al., 2008). Additionally, both qualitative and quantitative research showed that these categories were applicable to female naval personnel (Keegan, 1999; Sinclair, 2004; Taylor, 2005). Some research indicated that these factors might be further applicable to female naval aviators (Buettner, 2012; Keegan, 1999).

A data set from Defense Manpower Data Center, which included FNAs from year groups 1989 to 1998 was analyzed to determine the impact of organizational, career, and personal factors on retention. The data set was comprised of 16,000 individual rows of data that comprised 458 unique service records. After data sanitization and removal of incorrect and incomplete records, 197 records remained useful for analysis.

A logistical regression analysis determined that both number of dependents and age were statistically significant variables. Further investigation revealed the statistical significance of age might be due to the data preparation process. Age was also found to be somewhat correlated with the number of dependents.

In summary, this study achieved its goal of testing the hypotheses related to FNAs decisions regarding whether to remain in or leave active duty, operational naval aviation (ADONA). The findings of this thesis were consistent with the previous findings of other researchers. In order to gain a more accurate portrayal of FNA's reasons for leaving ADONA, the Navy should implement a continuous survey tool. This survey tool would allow the Navy to better meet the needs of service members.

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First and foremost, I would like to thank God for seeing me through this process and never leaving my side. I would also like to thank my wife, Amy Lynn, who is untiring in her support and is more than I had dared hope for in a wife. I would like to thank my children, who keep me laughing and remind me not to take myself too seriously. I would like to thank Captain Schmidt and Doctor Kennedy for their support and guidance throughout the thesis process. I would also like to thank the Human Resource Community for giving me the opportunity to attend this institution, and to learn the skills that made this thesis possible.

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I. INTRODUCTION

A. BACKGROUND

Since the Department of Defense adopted the policy of an all-volunteer force, retention of personnel has been an issue of concern to both strategic force planners and high-level operational personnel (Janowitz & Moskos, 1979). Many factors influence retention, and many force shaping tools have been used to influence service members to either remain in or leave the service (Janowitz & Moskos, 1979). In his study on Navy recruiting and retention, Wyatt (1999) noted that some of the common influencing factors are evident: economic factors, career factors, and personal factors. Consequently, force-shaping tools such as career bonuses, timed pay increases, and obligated service time continue to be employed to promote retention (Navy Personnel Command, 2011).

In recent years, as interest in a diverse force has grown, force planners look for ways to control retention of specific personnel (Eifert, 2008; Harvey, 2006; Navy Recruiting Orientation Unit, 2012). The reasons for targeting specific groups usually relate to operational needs, policy guidelines, and legal requirements (Navy Personnel Command, 2012). For example, operational need drives retention of personnel with particular skill sets, qualifications and specialties (Navy Personnel Command, 2011). Generally, policy guidelines and legal requirements are tied to promoting diversity and the retention of personnel covered by Title VII of the Civil Rights Act of 1964 (Defense Equal Opportunity Management Institute [DEOMI], 2012). In the military, race and gender are the two Title VII groups most closely monitored for human resources trends in recruitment, retention, and promotion. The existence of various advisory groups (e.g., Military Leadership Diversity Commission, Office of Women's Policy,

Defense Advisory Council on Women in the Service [DACOWITS]) and emphasis on strategic plans and policies (e.g., DoD Diversity and Inclusion Strategic Plan, DoN Diversity Policy) support this notion (Manning, 1997).

In accordance with leadership goals, force planners must find ways to achieve and maintain a nationally representative level of racial, ethnic and gender diversity (Ewing, 2008). However, current policy prevents granting cash incentives to a group based on race, ethnicity or gender (DEOMI, 2012). Therefore, force planners have attempted to use directed recruiting measures targeting specific groups of interest in an effort to increase the diversity of initial entrants (DEOMI, 2012). While those measures have had some limited success, retention continues to be an issue (Wyatt, 1999). After the initial obligated service time, female and non-Caucasian service members tend to leave at a rate disproportionate to male and Caucasian counterparts (Pinelis, Schmitz, Miller, & Rebhan, 2011).

Retention in the Naval Aviation Enterprise (NAE) is highly important to the Navy for several reasons. Chief among these reasons are the cost to train an aviator and the time involved in training the aviator. In 1999, the cost to train a Naval Aviator through basic flight training was approximately $1M. The cost rose to $9M when the pilot is fully trained with requisite operational experience (United States General Accounting Office, 1999). The time required to train a Naval Aviator varies based on the aircraft, but an approximate average is two years. A recent interview with Commander of Naval Aviation Training (CNATRA) staff aviation psychologist revealed training costs as $702K per student in the strike-fighter pipeline for 2011 (Walker, Personal Communication 2012). He also noted that helicopter pilots, who are the less expensive to train cost the Navy approximately $500K per student (Walker, Personal Communication 2012).

Little is known about the factors that drive individuals to choose Naval Aviation as a career. The reasons that experienced Naval Aviators cite for leaving the NAE are complex, including family concerns, high operational tempo,

time away from spouse, lack of advancement opportunity, etc. (Newell, Whittam, & Uriell, 2006). This variety of reasons creates an additional layer of complexity for force planners to take into consideration. From a financial standpoint, training female aviators is equally costly to training male aviators because all students, regardless of demographic or other attributes, must go through the same training.

Presently, Female Naval Aviators (FNAs) tend to attrite in training or leave active duty, operational Naval Aviation (ADONA) upon completion of their initial service obligation at a disproportionate rate (Office of Women's Policy, 2012). ADONA refers to FNAs who fulfill a specific set of criteria: where being a Naval officer is their primary job, they are serving as an unrestricted line (URL) officer, and they are eligible for flight duty. Although the rate of FNAs leaving ADONA has not attracted national attention, the Deputy Chief of Naval Operations for Manpower and Personnel (N1) noted the trend and commissioned a study to identify causes (Bowman, Personal Communication 2012). The necessary work to accurately determine why FNAs leave ADONA is unlikely to be resolved by a single study, however such an effort will provide insight as to what may be contributing to the retention challenge.

B. PURPOSE OF THE STUDY

The primary goal of this thesis is to determine if there are characteristics that could potentially predict a FNA's likelihood to attrite from ADONA once past the initial service obligation period of eight years. The secondary goal of this thesis is to determine if there are common characteristics among those FNAs who choose to leave ADONA. Determining the reasons FNAs choose to leave ADONA will assist force planning advisory groups like the Office of Women's Policy to achieve their goals of increasing female presence in the Navy. Further, it will help women considering Naval Aviation to make a more informed decision about their long-term goals based on the experiences of those who have come before them.

C. STATEMENT OF THE PROBLEM

FNA promotion and retention within the NAE were noted as areas of concern in the September 2008 CNO Diversity Accountability Review, and the retention concern is even more prominent after initial service obligation completion. The source of the retention problem is unclear. Some data points to personal factors like marriage and children being involved. However, there may be other less apparent factors like organizational culture or mission type. If factors underlying FNA exodus from the NAE are identified, solutions can be developed and tailored to counter them. Countering these factors would help the Navy maintain greater diversity. Further, retaining skilled Naval Aviators will cut training costs by reducing the need to train new personnel to fill the gap left by turnover. The problem is to determine which factors represent the greatest influence in causing FNAs to leave.

D. RESEARCH QUESTIONS

The overarching research question in this study is as follows: Do FNAs who voluntarily leave ADONA after the initial service obligation differ from FNAs who remain with respect to personal, organizational, and/or job characteristics? The following questions are raised to address the overarching question:

1. Do personal factors such as marital status and presence of dependent children influence a FNA's decision to leave ADONA?
2. Do education and demographic factors influence a FNA's decision to leave ADONA?

3. Do organizational factors like squadron type, number of female role models, squadron female percentage and squadron size influence a FNA's decision to leave ADONA?
4. Do job factors such as designator, total time deployed, percentage of service time deployed, total time on temporary assigned duty (TAD), and/or percentage of time assigned TAD influence a FNA's decision to leave ADONA?

Figure 1 presents an adaptation of Marin's (1979) turnover model that depicts how personal, organizational, and/or job factors that may weigh into a FNA's decision to leave ADONA. It also provides the hypothesized effect each factor will have on the likelihood of a FNA to leave ADONA. Chapter II covers Martin's model and the associated contributing factors in detail.

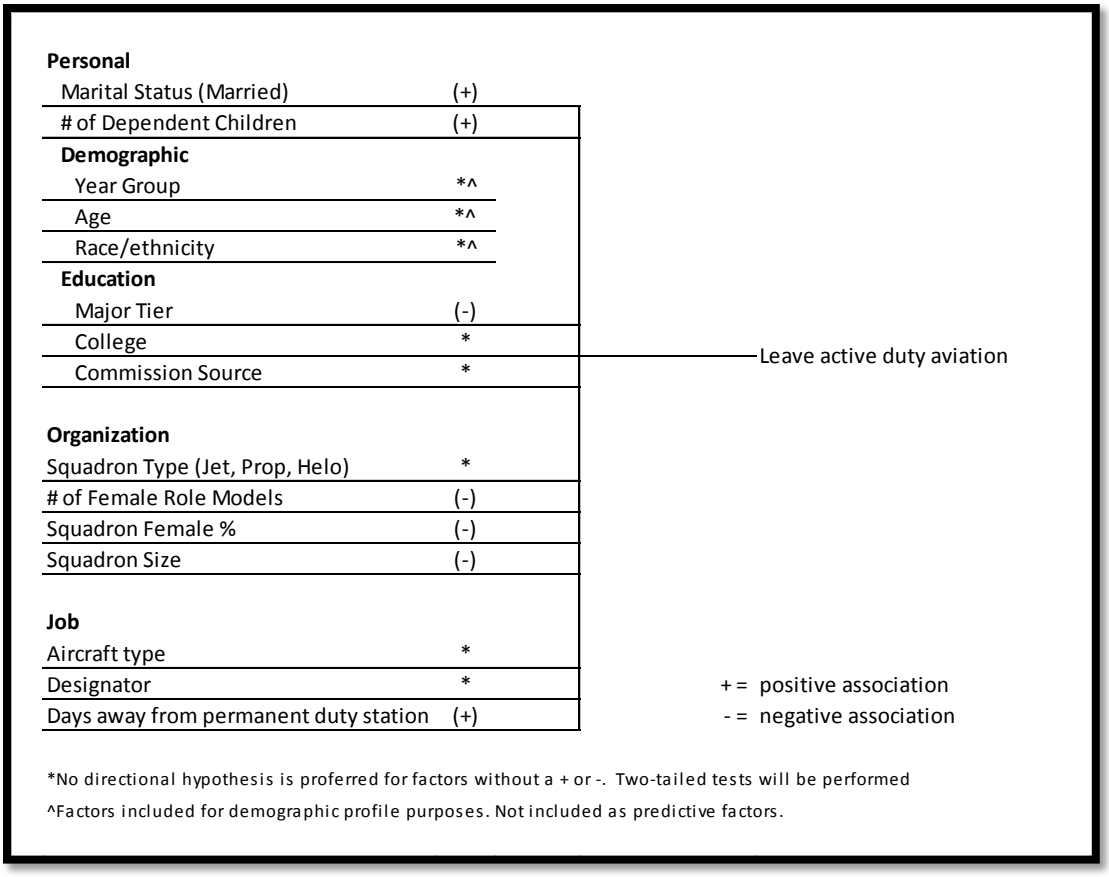

Figure 1. Proposed Factors Contributing to a FNA's Decision to Leave ADONA Including Hypothesized Effects (adapted from Martin, 1979)

E. HUMAN SYSTEM INTEGRATION (HSI) DOMAINS

DON (2011) defines HSI as:

> integrated analysis, design, and assessment over the life-cycle of a system and associated support infrastructure of the following seven domains: manpower, personnel, training (MPT); human factors engineering (HFE); personnel survivability; habitability; and, safety and occupational health.

The present research is relevant to three HSI domains: Manpower, Personnel and Training. The following paragraphs define each domain and provide a rational for its relevance to this effort.

Manpower is “The mix of military, DoD civilian, and contract support necessary to operate, maintain, and support (to include providing training) the system (DoD, 2008).” Force planners develop models based on expected accession and retention rates, which are used to project future manpower requirements. Discovering common characteristics of FNAs who choose to leave active duty naval aviation will help force planners to make accurate predictions.

Personnel is “the human performance characteristics of the user population based on the system description, projected characteristics of target occupational specialties, and recruitment and retention trends (DoD, 2008).” It is concerned with the attributes of individuals fulfilling a particular role or position. Within the personnel domain, HSI seeks to discover the appropriate knowledge, skills, abilities and other characteristics that provide the best person for the position or organization throughout the life cycle of the system. Determining which issues influence FNAs to leave the NAE will help to maintain a diverse force.

Training is the “options that enhance user capabilities, maintain skill proficiencies, and reduce individual and collective training costs (DoD, 2008).” The results of this thesis may provide information that can be reintegrated into the NAE in the form of training. Training key personnel at various points in the aviation pipeline could help to provide FNAs with additional support or information needed regarding the decision to remain in or leave the service.

F. ORGANIZATION

This thesis encompasses five chapters: Chapter I provided an overview and background of retention issues in the Navy and Naval Aviation, with emphasis on FNA retention. Chapter II explores the literature regarding turnover in the civilian workforce, retention in the military, and retention among FNAs. Chapter III discusses the method of data collection and analysis leveraging

archived data from the Defense Data Manpower Center (DMDC). Chapter IV presents the results of the data analysis. Chapter V offers conclusions and recommendations based on the findings.

II. LITERATURE REVIEW

A. OVERVIEW OF TURNOVER

Turnover is a term that encompasses employees who have left an organization for any reason and must be replaced (Mathis & Jackson, 2008). There are two primary types of turnover: voluntary and involuntary (Mathis & Jackson, 2008; Allen, 2008). Of the two types, employers are mainly concerned with controlling voluntary turnover, which occurs when an employee leaves by choice regardless of the particular reason (Mathis & Jackson, 2008). Employers try to limit turnover in various ways, such as realistic job previews, employee orientation programs, compensation packages, internal progression, etc. (Mathis & Jackson, 2008). Allen (2008) further suggests that recruitment and selection are an integral part of controlling turnover. Even with extensive turnover prevention programs, some turnover is unavoidable (Mathis & Jackson, 2008; Allen, 2008).

B. TURNOVER RESEARCH

Mathis and Jackson (2008) proffer that extensive turnover research has revealed three broad categories that appear to drive turnover: external, work related and personal factors. Previous research on turnover has investigated how causal factors relate to an employee's intention to leave and appear to be consistent with Mathis & Jackson's (2008) statement. A study by Martin (1979), focused on developing a contextual model of employee turnover intentions. The model sought to improve upon previous research that focused mainly on demographic variables and job satisfaction as predictors of intention to leave. Martin (1979) added a set of assumptions about the motivational process behind the decision to leave, using it to create a framework model of intent to leave. His model depicts how each factor leads to employee intent to leave (Figure 2). He

found that, among others, opportunity, sex, occupation and age were significant predictors of retention at the $p < .05$ level. Although Martin addressed gender as an independent variable, however, it was not the primary focus of his research. Additionally, his data set was limited to a survey of 500 people in a small mid-western firm.

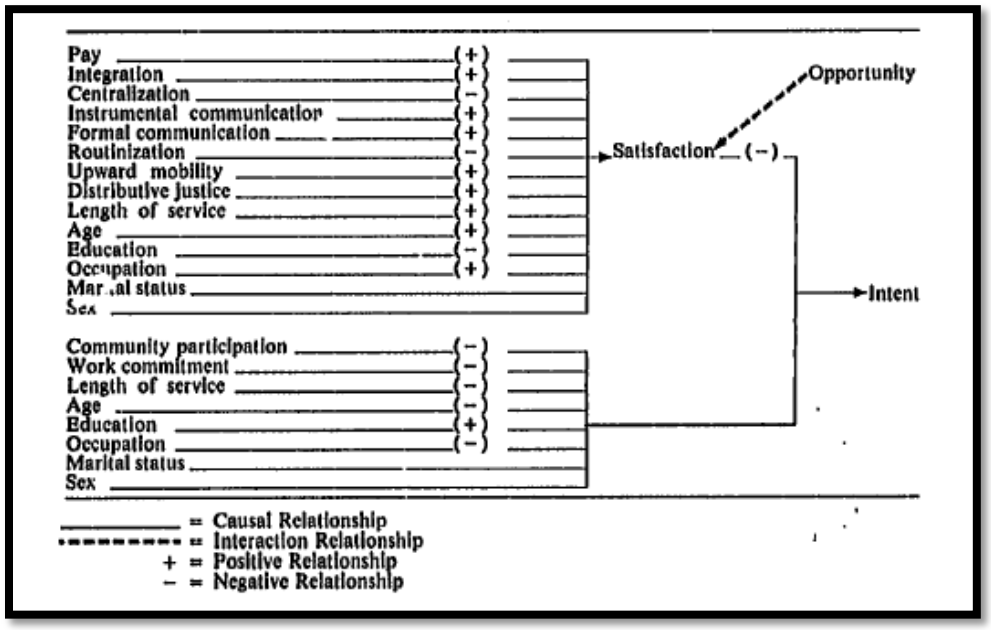

Figure 2. Causal Model of Intent to Leave Work (From Martin, 1979)

C. FEMALE TURNOVER

An earlier 1974 study, however, focused specifically on attrition by gender among air traffic controllers (ATCs), a heavily male-dominated workplace. The study found that female ATCs left at a rate more than double that of males. The researchers found that 80% of ATC attrition could be attributed to four factors: training difficulties, family, other employment or perceived discrimination (Table 1). For females, the two primary reasons consisted of family problems and sex discrimination (Mathews, Collins, & Cobb, 1974).

Table 1. Reasons for Female Air Traffic Controllers Turnover (From Mathews, Collins, & Cobb, 1974)

	Females		Males	
	N	%	N	%
a. Disliked shift work	3	7.5	2	3.8
b. Pay inadequate	0		0	
c. Lacked aptitude for job	0		2	3.8
d. Poor working conditions in facility	0		0	
e. Too much responsibility in job	1	2.5	2	3.8
f. Discriminated against by co-workers, supervisors, or management because of my age, race, or sex	6[a]	15.0	3	5.8
g. Failed training	9	22.5	11	21.2
h. Health problems	2	5.0	3	5.8
i. Desired different geographic location	0		2	3.8
j. Family problems	11	27.5	4	7.7
k. Lack of motivation for job	0		3	5.8
l. Little in common with co-workers	0		0	
m. Disliked treatment by co-workers	0		0	
n. Disliked treatment by supervisors	0		0	
o. Training was inadequate	5	12.5	10	19.2
p. Got a job I considered better	1	2.5	5	9.6
q. Found I didn't like this type of work	2	5.0	2	3.8
r. Insecurity	0		1	1.9
s. Other	0		2	3.8
Total	40		52	

[a] All six women cited sex discrimination; two added age and one added racial discrimination.

In a more recent study, Glass and Riley (1998) looked into female retention in the context of family responsiveness in the workplace. Their study utilized a sample of 324 females from various job types who were recruiting through prenatal hospital records. Glass and Riley postulated that many females leave for reasons related to lack of workplace flexibility in terms of childcare, maternity leave, part-time work or phased returns to work. They noted that previous studies indicated that females tend to leave male-dominated workplaces after childbirth, favoring female-dominated workplaces if they returned to work. Glass and Riley's "Conceptual Model of the Job Turnover Process following Childbirth" expected work hours reduction to be the primary driver of turnover (Figure 2).

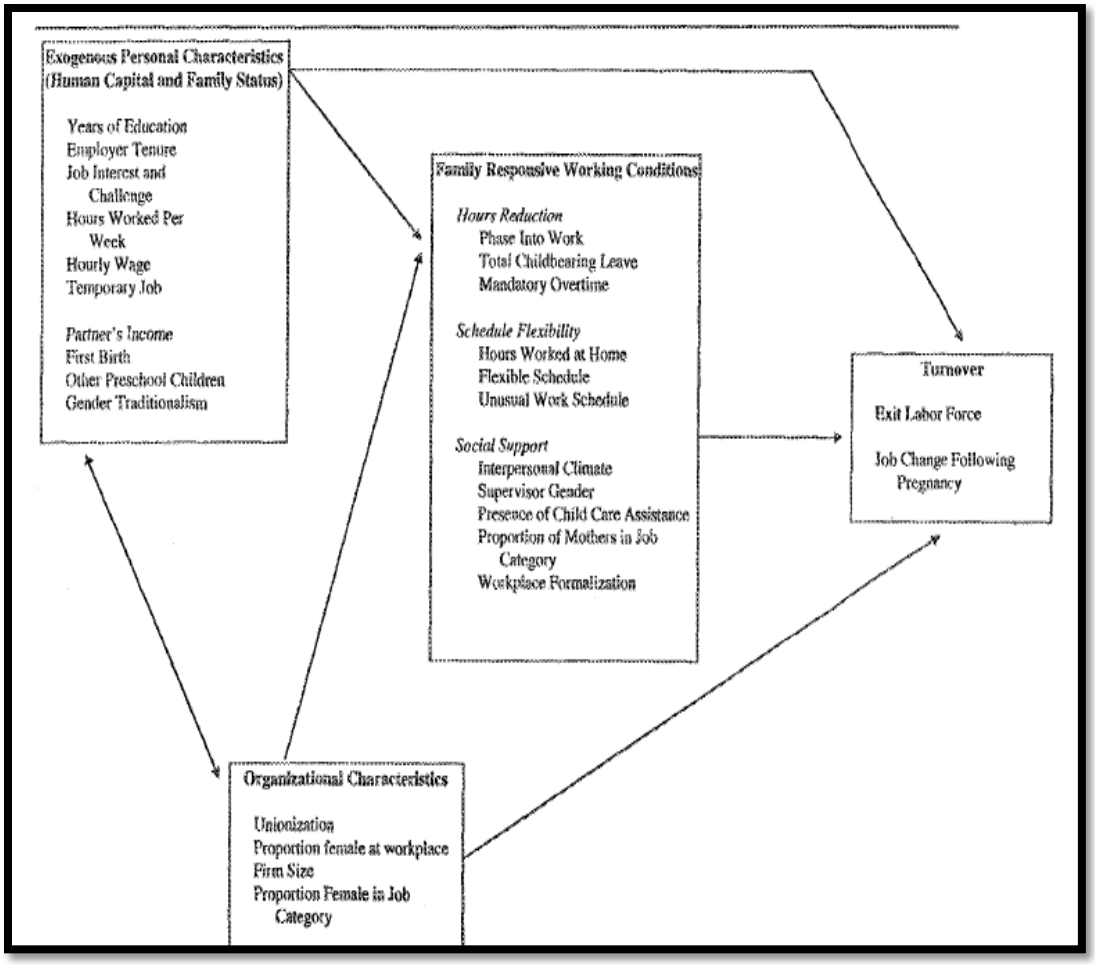

Figure 3. Conceptual Model of the Job Turnover Process following Childbirth (From Glass & Riley, 1998)

In their sample, Glass and Riley (1998) observed much higher retention than expected (~70%). However, they noted that childbirth is often followed by decreased achievement in the workplace. They further offered that employer expectation of employee turnover following childbirth may play a role in discrimination against females. That is to say that employers expect that females will leave the workplace after childbirth before they communicates any intention. Childbearing leave also played an important role, wherein Glass and Riley (1998) observed that increased childbearing leave time increased the likelihood to stay. Further, social support from both supervisors and co-workers were revealed to

strongly influence on retention. It is important to note that Glass & Riley (1998) focused specifically on retention of females following childbirth. While their findings are important to note, they do not necessarily generalize to all women.

In a more recent study, Cropsey, et al. (2008) looked into the issue of retention among women on the faculty of a four-year medical school. They noted that although women make up 50% of medical students, they "continue to be underrepresented in faculty positions, particularly leadership and advanced faculty positions" (Cropsey, et al., 2008, p. 1116). They further noted that attrition for women is higher than that of men. Mathis & Jackson (2008) agree, revealing that the overall female turnover rate is twice that of males. The factors that Cropsey, et al. (2008) found to be significant among female medical faculty included departmental leadership issues, professional advancement, low salary and personal/family reasons. They also noted that these reasons were consistent with findings in other literature.

D. MILITARY TURNOVER

The effect of common influential factors (e.g. economic, career, personal) on turnover has been addressed in previous literature (Mathis & Jackson, 2008). Janowitz and Moskos (1979) invite us to consider economic factors: if the economy is doing well, job opportunity outside the service is high and turnover is high, whereas if the economy is doing poorly, job opportunity outside the service is not as prevalent and turnover is low. Career factors such as co-worker interaction display a similar phenomenon. For example, if a service member does not "fit the mold" he or she may not enjoy working in that field and may be more likely to leave the service (Gjurich, 1999). Further, as the service member increases in rank, he or she is more likely to remain as retirement eligibility approaches (Gjurich, 1999). Finally, there is the issue of personal factors, which encompass a broad variety of issues, but can be generally aggregated by isolating and combining those that are most influential (Sinclair, 2004; Keegan,

1999). For example, if a service member's spouse or relatives desire that he or she leave the service, he or she is more likely to do so (Sinclair, 2004). Further, if a service member desires to start a family, he or she may view that as incompatible with military service (Keegan, 1999). Although these instances express generalized assumptions regarding factor effects, they communicate some underlying truths about the economic, career and personal factors that affect retention.

Like the common influential factors that affect retention, force-shaping tools used to affect retention are similarly evident. Three retention tools widely used in the Navy consist of obligated service time, selective bonuses, and the pay scale structure (Navy Personnel Command, 2011). Obligated service time is assigned for various reasons and is controlled by either US law or military regulations, and it equates to a basic quid pro quo scenario. The Navy offers the service member a benefit in return for a promised period of service time (Navy Personnel Command, 2010). A pertinent example is Title 10 USC, Subtitle A, Part II, Chapter 37, § 653, which stipulates an eight year active duty service requirement for fixed wing pilots and a six year obligation for flight officers.

Selective bonuses as another force-shaping tool, are generally applied to specific skill sets that the Navy wishes to retain (Chief of Naval Operations, 2007). They apply to both enlisted personnel and officers, and are found on the Defense Finance and Accounting Service (DFAS) website. Notable examples include special and incentive pays granted to aviators, nuclear qualified officers, judge advocates general and medical personnel (DFAS, 2011). Special and incentive pays tend to target these groups since they are difficult to recruit, expensive to train and have lucrative job opportunities outside the military (DFAS, 2011).

Finally, the pay scale structure operates as a type of retention tool (Janowitz & Moskos, 1979; Wyatt, 1999). Although the pay scale mostly remains static, the timing of pay increases usually aligns with periods during which a

service member has a choice to leave the service (DFAS, 2012). A good example is the pay increase that accompanies 10 years of active duty service time. For an officer, this is often closely followed by attaining the O-4 rank that amounts to a pay increase of nearly $1000 per month, one of the largest pay increases for a junior officer (Wyatt, 1999).

E. FEMALE NAVAL AVIATOR RETENTION

In a brief given by Capt. McNinch, the Director of Enlisted Programs at the Bureau of Personnel, the Navy's diversity target seeks to match national college graduate rates (McNinch, 2012). According to the National Center for Education Statistics, the percentage of Bachelor's degrees conferred by race for the 2008–2009 school year was as follows: Whites 71.5%, Blacks 9.8%, Hispanics 8.1%, Asians 7%, and others 3.7% (Institute of Education Sciences [IES], 2012). A truly stark difference in representation, however is noted when comparing the percentage of female Naval Officers in Naval Aviation (6.7%) with the percentage of women who earned a Bachelor's degree during the 2008–2009 school year (57.2%) (IES, 2012).

From a training perspective, the ability of a Student Naval Aviator (SNA) to finish flight school is largely predicted by Aviation Selection Test Battery (ASTB) score (Lopez & Denton, 2011). The ASTB has shown to be a good predictor of success in Naval Aviation training independent of demographic data (Lopez & Denton, 2011). An individual with a high ASTB score has a greater chance of successfully completing flight school that an individual with a low score (Lopez & Denton, 2011).

Since the ASTB predicts performance in ground school and primary flight training, it loses its relevance after "winging" (Lopez & Denton, 2011). Once an individual joins the Fleet as a designated Naval Aviator, he or she has already so to speak "made the cut." One might expect that the likelihood of individuals to leave the service after that point would be distributed fairly equally across the

demographic spectrum. As of September 2010, however, Blacks represented 7.8% of the entire Naval Officer Corps, Hispanics 6.2%, Asians 4.1% and others 3% (Sudduth, 2010). FNAs however continue to be heavily underrepresented. Presently, FNAs represent only 6.7% of the entire community of Naval Aviators (Office of Women's Policy, 2012).

Sims, Drasgow, and Fitzgerald (2005) used time dependent modeling to investigate the effects of sexual harassment on turnover in the military. They discovered that females exposed to sexual harassment were likely to leave either the job or organization to escape it, depending on the extent of the perceived threat. Additionally, the research revealed that female officers were more likely to experience sexist hostility as opposed to other forms of sexual harassment (Sims, Drasgow, & Fitzgerald, 2005).

The year after Glass and Riley's study, Keegan (1999) conducted a study of factors affecting retention of FNAs and Naval Flight Officers (FNFOs) who deploy at sea. Her method consisted of semi-structured interviews with 21 FNAs and FNFOs. She organized the interview transcripts into a series of themes discussing the findings. Although the reasons for leaving varied, family concerns and leadership issues were common reasons. Further, many of the females felt that having children was inconsistent with a traditional Naval Aviation career. Of note, all the interviewees had experienced some form of gender bias or discrimination. Most interviewees also felt that their commitment to the Navy had lessened over the years and that the Navy could do nothing to retain them. Also, all interviewees indicated their time to have children was limited and felt a need to start. Finally, 19 of the 21 females (90.5%) relayed that they planned to leave the Navy (Keegan, 1999).

Although Keegan's paper did not include a statistical analysis, the sample was representative of females in different aircraft communities and geographical locations. The reasons given by many interviewees regarding their intention to leave corresponded with previous research. Perhaps not surprisingly, this issue

is not contained purely to Naval Aviation. Similar issues have been noted in other fields such as academia (Dryfhout-Ferguson & Estes, 2004), European sports clubs (Guillet, Sarrazin, Fontayne, & Brustad, 2006), the legal field (Harrington & Mclaurin, 2008), and information technology (Leroy, Tolle, & Perkins, 2008). Although the researchers came to different conclusions, family issues and perceived gender discrimination were a recurrent theme.

Providing further quantitative underpinning to Keegan's research, Sinclair (2004) conducted research regarding the military/family conflict with respect to female officer retention. He used path modeling to predict female intentions at the next career decision point. Figure 4 depicts Sinclair's (2008) model of how family factors and job experience feed into job satisfaction, military commitment, and, subsequently, the intent to leave to remain in the naval service.

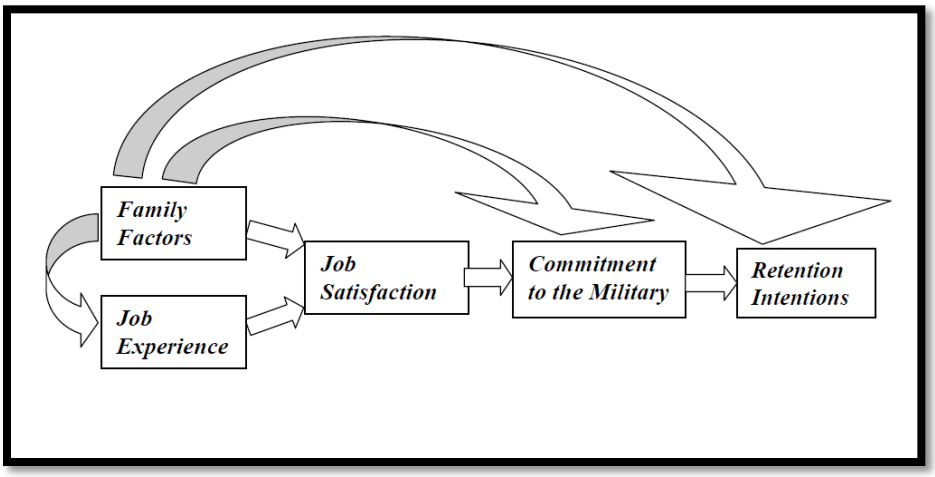

Figure 4. Path Model for Predicting Female Officer Retention (Sinclair, 2004)

Using data from the 2002 Navy Quality of Life (QOL) survey, Sinclair's model accounted for 10.2% of the variance the dependent variable: career plans at the next decision node. Table 2 depicts the hierarchical regression steps he took in predicting female Naval Officers' retention intentions. Of note, he pointed

out that the higher percentage of married females without children relative to their single or married with children counterparts could indicate some self-selection bias in terms of family factors (Sinclair, 2004).

Table 2. Hierarchical Regression Steps in Predicting Female Naval Officers' Retention Intentions (From Sinclair, 2004)

STEP	CONSTRUCT	VARIABLE(S)
Step 1	*Family Factors*	Marital status (Married / Not Married)
		Children under 21 years living at home (Yes / No)
		Satisfaction with time spent with family members (Composite)
Step 2	*Job Experiences*	Days away from permanent duty station in the past year
		Service aboard a ship for > 90 days (Currently / In the Past / Never)
		Satisfaction with personal development (Composite)
Step 3	*Job Satisfaction*	Satisfaction with Job (Composite)
Step 4	*Commitment*	Commitment to the Military (Composite)

F. SUMMARY

Based on the research to date, no conducted quantitative analysis is specific to the retention of FNAs. Although both Keegan and Sinclair revealed important issues about females in aviation and general female officers, respectively, neither addressed the specific research questions posed in this study. Evidenced by the literature, a healthy volume of research investigating the issue of gender retention in various fields exists. The importance of this research and that still remains cannot be understated. The body of research could benefit from a quantitative examination of retention issues facing females in Naval Aviation.

As presented earlier, a model was adapted to identify factors influencing FNA's decisions to leave ADONA (Figure 1). Its structure primarily draws on Martin's (1979) turnover model, with adjustments based on work done by Keegan

(1999) and Sinclair (2004). The identified factors are organized into three groups: personal, organization, and job factors. Personal factors primarily relate to characteristics or attributes observed in a person (e.g. marital status, number of dependent children). The two subgroups included under personal factors, demographic and education, are of special interest to potential readers (e.g. DEOMI, DACOWITS, CNET [Commander, Naval Education and Training]). Organization factors encapsulate characteristics or attributes that are inherent in a specific organization (e.g. squadron size, number of female role models). Lastly, job factors isolate those characteristics or attributes related to a particular job (e.g. designator, days away from permanent duty station).

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III. METHODS

A. OVERVIEW

This study examined the factors related to FNA choices to discontinue serving as Naval Aviators past their initial obligation period after winging. FNAs were broken into two groups: those who chose to remain in ADONA and those who chose not to remain in ADONA. The factors hypothesized to cause FNAs to leave flight status were broken into three groups: personal factors, organization factors and job factors. Personal factors sought to capture current and permanent non-career characteristics in a FNA's life that might cause her to leave ADONA. Personal factors were further subdivided into demographic and education groups, which represent those characteristics that existed before a FNA chose to become a Naval Aviator. Organization factors examined the squadron type, seeking to capture any organizational influence that might be attached to a jet, propeller or helicopter squadron. Finally, job factors examined the specialty (pilot or flight officer), to determine whether the particular type of work influenced the retention decision.

B. DATABASE

The DMDC database was queried to access historical personnel information through electronically submitting a data request form available on the DMDC website. The data from DMDC consisted of FNAs from promotion year groups 1989 to 1998. This time range allowed FNAs to have served the initial service obligation as of 2008, affording them the opportunity to leave either operational flight status and/or Naval service. In addition, nine years of promotion groups provided a sufficient length of time to begin observing any trends in the data. Table 3 lists the data fields available in the database, along with a corresponding description of each data field.

Table 3. Description of data fields in the DMDC database

Data Field	Description
Last 5 of SSN	The last five digits of the FNA's social security number
File Date	The year and month of the data row
Marital Status	A one character code representing the marital status of the FNA
Dependents	The number of dependents claimed by the FNA
Pay Grade	The two character paygrade identifier of the FNA (O1, O2, etc)
Date of Rank	The year and month at which the FNA attained her current rank
Age	The two digit age of the FNA
Race	A code representing the FNA's selected race
Hispanic?	A Y/N code representing whether the FNA claims Hispanic heritage
UIC	The six character unit identification code
PMOS	The four digit primary military occupational specialty code
Service	A one character code representing the FNA's service
Component	A one character code representing the FNA's active status
RCC	The one character reserve component code
TRC	Unknown
Separation Date	The year, month and day the FNA left active duty status
Service at Separation	A one character code representing the FNA's service at separation
ISC	A four digit separation code indicating reason for separation
Reason for Separation	The decoded translation of the ISC data field
Accession Source	A one digit code representing the commission source
Date of Initial Entry to Military Service	The year, month and day of initial entry into military service
Date of Initial Entry to Reserve Forces	The year, month and day of initial entry into the reserve forces
AQD1	A three digit code representing a special qualification
AQD2	A three digit code representing a special qualification
AQD3	A three digit code representing a special qualification
AQD4	A three digit code representing a special qualification
BUPERS Loss Code	The Navy specific reason for separation
ACTIVITY	Unknown
GEOLOC_CD	Unknown
RIF_TAC	Unknown
OFF_SOURCE	Unknown
AERO_DESIG	Unknown

C. HYPOTHESES

The proposed hypotheses were developed based on both literature reviewed and the availability of existing data. The main personal factors examined were marital status and number of dependent children. Research from Keegan (1999) and Sinclair (2004) indicated that the positive presence of both characteristics could be significant factors in a FNA's decision to leave ADONA. Age was explored as a factor that can potentially affect a FNA's outlook on life. Keegan (1999) and Glass & Riley (1998) indicated, respectively, that women in their late twenties showed an increased desire and propensity to bear children, if they had not already done so. Further, Buettner (2012) noted that FNA's perspectives on bearing children tend to change from their early twenties to mid-thirties.

Based on previous studies, ethnicity and year group were not expected to yield statistically significant results, but were included to gain insight into the profile of FNAs (Taylor, 2005). Commission source, however, has been shown to affect the choices officers make with respect to their career. Demirel (2002) found that officers attending the Naval Academy were slightly more likely to remain on active duty past the initial obligation period than those from other commissioning sources.

Organization factors involve the characteristics related to the organizational culture of which a FNA is a part. Naval aviation culture tends to attribute certain attributes to the ideal image of what an aviator should be (Barrett F. J., 1996; Keegan, 1999). Squadron type (jet, propeller or helicopter) was chosen because it represents a differentiation of organizational culture within naval aviation. For example, the SH-60B helicopter community is different from the FA-18 community both in mission and organization, which creates the

conditions for a difference in culture. Further, because aircraft type relates to mission type, it can give a general indication of how often and for how long a FNA would deploy.

Job factors relate to the actual work in which a person is engaged. The duties of a pilot and naval flight officer are very different. The pilot's primary responsibility is safety of flight, whereas the flight officer is primarily concerned with the mission. Job specialty was examined as a potential retention factor in many of the studies reviewed (Taylor, 2005; Poindexter, 1998; Dryfhout-Ferguson & Estes, 2004). The variable examined as a job factor was PMOS or designator, which is 1310 for an active duty, operational pilot and 1320 for an active duty, operational NFO.

Data available in the database limited the testing of the original model proposed in Chapter II. A new model based on the available data is displayed in Figure 5. A description of the variables included in the new model, along with the data coding scheme, is depicted in Table 4.

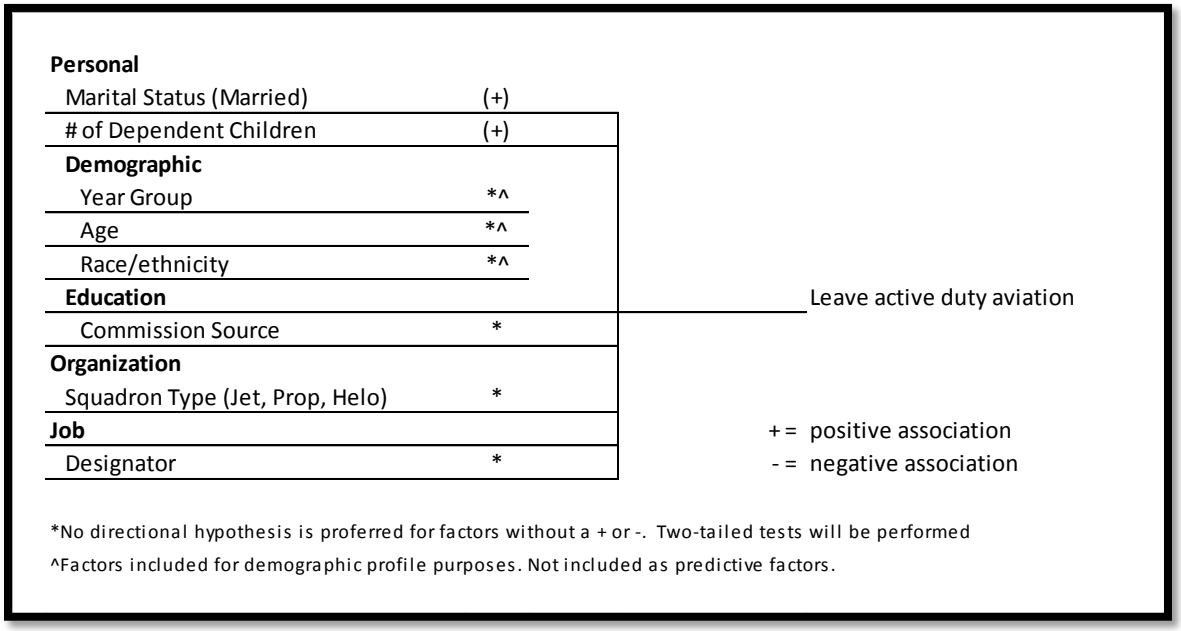

Figure 5. Proposed Factors Contributing to a FNA's Decision to Leave ADONA Including Hypothesized Effects (adapted from Martin, 1979)

Table 4. Description of variables and coding scheme used for analysis

Variable	Description	Code
ADONA status	Dependent Variable	1 = remained in ADONA status for 13 or more years 0 = remained in ADONA status for 12 or less years
Personal Variables Category		
Marital Status	Indicates a service members marital status	0 = single 1 = married
Dependents	Indicates number of dependents recorded	x = number of dependents
Demographic Variables Sub-category		
Year group	Indicates fiscal year (FY) group of promotion. (e.g., OCT94 to SEP95 = year group 95)	xx = two digit year group
Age	Age at separation	xx = two digit age
Race	Professed race	0 = Caucasian 1 = African American 2 = other 3 = unknown
Education Variable Sub-category		
Commission Source	Source from which the FNA was commissioned	0 = US Naval Academy 1 = ROTC Scholarship 2 = OCS 3 = ROTC Non-Scholarship 4 = Other
Organization Variable		
Squadron Type	The type of squadron that the FNA was part of	0 = Helicopter 1 = Propeller 2 = Jet 3 = Unknown
Job Variables		
Designator	Indicates the FNA's aviation specialty (PMOS)	0 = pilot 1 = naval flight officer

The variables addressed in the literature address the research questions through six hypotheses to determine the impact of personal, organization and job factors on FNAs remaining in ADONA status. All hypotheses will be tested at the $\alpha = .05$ level. The modified research questions and the corresponding hypotheses were as follows:

1. Research Question 1

Do personal factors such as marital status and presence of dependent children influence a FNA's decision to leave ADONA?

$H1.1_0$: There is no difference between the number of FNAs who leave ADONA or remain in ADONA with respect to marital status.

$H1.1_A$: FNAs who leave ADONA are more likely to be married than FNAs who remain in ADONA.

$H1.2_0$: There is no difference between the number of FNAs who leave ADONA or remain in ADONA with respect to existence of dependent children.

$H1.2_A$: FNAs who leave ADONA are more likely to have dependent children than FNAs who remain in ADONA.

2. Research Question 2

Do education and demographic factors influence a FNA's decision to leave ADONA?

$H2.1_0$: There is no difference between the number of FNAs who leave ADONA or remain in ADONA with respect to age.

$H2.1_A$: FNAs who leave ADONA are more likely to be younger than FNAs who remain in ADONA.

$H2.2_0$: There is no difference between the number of FNAs who leave ADONA or remain in ADONA with respect to commission source.

$H2.2_A$: There is a difference between the number of FNAs who leave ADONA and FNAs who remain in ADONA with respect to commission source.

3. Research Question 3

Do organizational factors influence a FNA's decision to leave ADONA?

$H3_0$: There is no difference between the number of FNAs who leave ADONA or remain in ADONA with respect to squadron type.

$H3_A$: There is a difference between the number of FNAs who leave ADONA and FNAs who remain in ADONA with respect to squadron type.

4. Research Question 4

Do job factors influence a FNA's decision to leave ADONA?

$H4_0$: There is no difference between the number of FNAs who leave ADONA and FNAs who remain in ADONA with respect to designator.

$H4_A$: There is a difference between the number of FNAs who leave ADONA and FNAs who remain in ADONA with respect to designator.

D. DATA PREPARATION

The database received from DMDC required a large amount of data sanitization. The data was received in MS Excel format and contained over 16,000 individual rows of data that comprised 458 unique service records. Each row displayed an instance or snapshot of a FNA's career. The rows were separated by three-month increments starting with the date of initial entry into military service (DIEMS) and ending with the date of her separation from the military. The data set also contained 33 columns containing information about different aspects of an FNA's service record. An initial look at the data revealed that many records were missing data and that the dataset also contained records that were outside the target population. Therefore, the first step involved separating out records with missing data or that outside the target population.

In order to preserve the original data, an additional worksheet was created to collect the records removed for invalid data. The first records removed were those females who were members of other DoD services. In all, 619 rows comprising 16 unique records were determined to be women from other services.

The next step involved removing records based on incorrect PMOS (Primary Military Occupational Specialty). The codes consisted of four numeric characters, with some codes followed by a two character alphabetic extension. The column was split into PMOS and PMOS extension. Next, all records that did not contain a PMOS of 13XX in at least one row during the entire service career were removed. This totaled 82 rows and 4 unique records. After PMOS sanitization, rank data was examined. All records were required to have a rank of 01 with a corresponding date of rank that was greater than September 31, 1990 and less than October 1, 2002. This ensured that all the data set would capture FNAs between promotion year groups 1989 to 1998. In all 6,468 rows and 226 unique records were removed.

The large amount of data removed during the rank sanitization process prompted a closer look at the data. The reason for removing several records was tied to the query process that generated the initial database. The query included all FNA service records that displayed a 13XX designator at any point between September 30, 1988 and October 1, 2002. This would include FNAs commissioned prior to September 30, 1988. A brief look through the removed records confirmed that most of the removed records were due to commissions prior to September 30, 1988.

The remaining records appeared consistent and valid according to the criteria of the study. The final record set consisted of 8,970 rows with 224 unique records. After record set sanitizing, it was date formatted. The DMDC data arrived in text format, necessitating conversion to Excel's date format to perform date calculations. In this manner, records were classified as either retained or attrited depending upon whether the FNA remained both on active duty and in Naval Aviation past the initial obligation period.

The final step in reducing the data involved isolating the row prior to a FNA leaving ADONA. In order to ensure the proper row was collected, the records were isolated by PMOS and component. The PMOS ensured that the

member was operational. If a member switched to a designator other than 13XX, all following rows were removed and that date became her separation date. In a similar manner, component determined active duty status. Once a FNA's status changed from 'R' indicating active duty to 'V' indicating reserve, the following rows were removed. The resultant subset provided 224 rows of unique FNAs just prior to leaving ADONA.

After the data was reduced, there were still missing entries in some data categories. The PMOS extension category, which specifies the type of aircraft flown, was the first category addressed. Each record missing a PMOS extension was compared against the original database. If the record contained any row with an aviation PMOS extension, that field was copied to the separation row. All but eight records were able to be identified in this manner. The remaining eight were categorized as unknown.

The next category corrected for missing data was the ISC column. This column specified the reason for separation. All records missing data in this category were labeled with a period as a placeholder. Comparison against the original database revealed that these values were truly null. The period was replaced with a 2099 code and categorized as "Other" for separation reason.

In an effort to remove any records that represented involuntary separation, a combination of ISC and duration of ADONA service was employed. If a FNA had less than 8 years of ADONA or had an ISC that indicated an involuntary separation, her record was examined. If she did appear to have left ADONA involuntarily, her record was removed from the pool. As a result of this screen 27 records were removed, leaving 197 records ready for analysis. The records were separated into two worksheets labeled retained and attrited. FNAs with a duration of ADONA that was 12 years or less were classified as attrited. FNAs with a duration of ADONA that was 13 years or greater were classified as retained. Of the 197 records retained for analysis, 150 were classified at attritted and 47 were classified as retained.

E. DATA ANALYSIS

Because the dependent variable, "ADONA status" was dichotomous and the independent variables were mainly categorical, logistic (or logit) regression was selected to analyze the data. Further, logistic regression has been used to analyze turnover in several previous studies, some of which were military and aviation specific (Poindexter, 1998; Gjurich, 1999; Dryfhout-Ferguson & Estes, 2004; Sims, Drasgow, & Fitzgerald, 2005; Taylor, 2005). Given the set of independent variables, logistic regression returned a probability that a FNA would attrite. The general model for the logistic regression was:

$$Pr(Y = 0 \mid X_1 = x_1,\ldots,X_p = x_p) = 1 / (e^{\wedge}(\beta_0 + \beta_1 x_1 + \ldots + \beta_p x_p)$$

where Y was the probability that a FNA would leave ADONA prior to thirteen years of service and X_1 to X_p represent the independent variables used to predict the Y. The coefficients indicating the direction of effect are indicated by the β corresponding to each x.

F. PROTECTION OF HUMAN SUBJECTS

This study was approved by the Naval Postgraduate School Institutional Review Board and assigned the protocol number NPS.2012.0065-IR-EM2-A. In accordance with the IRB protocol, all data was de-identified to a remove any personal identification. Demographic data collected was limited to data believed to have pertinence to the analysis. Data was stored on an access-controlled secure drive on the NPS servers. Results distributed to interested parties did not contain any personally identifiable information.

IV. RESULTS

A. DESCRIPTIVE STATISTICS

Because the number of records used was relatively small and the data largely consisted of categorical values, the descriptive statistics are presented in percentages instead of means and variance. Of the 197 records retained for analysis, 47 (23.9%) were classified as retained in ADONA and 150 (76.1%) were classified as attrited from ADONA. This corresponds to a 76.1% attrition rate among FNAs. Table 5 depicts columns representing (1) the entire population of FNAs for the given time span, (2) FNAs who remained in ADONA for 13 or more years and (3) FNAs who left ADONA at 12 or fewer years.

The DMDC database included several categories for marital status, including divorced, annulled and widowed. However, FNAs fell into only two types: single (never married) and married. Of those types, 45.2% of FNAs were single and 54.8% were married. Additionally, most of the FNAs (69%) had no children and of those who did have children, 18.3% had one, 6.6% had two, 3.6% had three, and 2.5% had four or more. When categorized by race, an overwhelming majority, 94.9%, were Caucasian. Only 2% were African American, while another 2% were other races. There was no race data available for 1% of the records.

Promotion year groups, sometimes simply called “year groups,” are generally the fiscal year in which an officer was first commissioned. The FNAs were fairly evenly distributed across the year groups, ranging from 17 to 31 FNAs per year group. The only exceptions were year groups 89, 97 and 98, which had 5, 2 and 1 FNA, respectively. A cross-check with other sources indicated that these numbers might be low. However, DMDC indicated that the database

provided included all available records. It is important to note that, as with any data set retrieved from an existing database, there is the possibility of missing and/or incomplete information.

Table 5. Descriptive Statistics for Population, Remained and Attrited FNAs

	Population (N=197)		Remained (N=47)		Attrited (N=150)	
	n	%	n	%	n	%
Marital Status						
Single	89	45.2%	19	40.4%	70	46.7%
Married	108	54.8%	28	59.6%	80	53.3%
Dependents						
0	136	69.0%	27	57.4%	109	72.7%
1	36	18.3%	7	14.9%	29	19.3%
2	13	6.6%	4	8.5%	9	6.0%
3	7	3.6%	5	10.6%	2	1.3%
4	4	2.0%	3	6.4%	1	0.7%
5	1	0.5%	1	2.1%	0	0.0%
Year Group						
88	5	2.5%	2	4.3%	3	2.0%
89	27	13.7%	5	10.6%	22	14.7%
90	29	14.7%	12	25.5%	17	11.3%
91	31	15.7%	6	12.8%	25	16.7%
92	25	12.7%	5	10.6%	20	13.3%
93	17	8.6%	5	10.6%	12	8.0%
94	31	15.7%	6	12.8%	25	16.7%
95	29	14.7%	4	8.5%	25	16.7%
96	2	1.0%	1	2.1%	1	0.7%
97	1	0.5%	1	2.1%	0	0.0%
98	0	0.0%	0	0.0%	0	0.0%
99	0	0.0%	0	0.0%	0	0.0%
Age						
29 or younger	8	4.1%	0	0.0%	8	5.3%
30 to 33	119	60.4%	0	0.0%	119	79.3%
34 to 36	28	14.2%	6	12.8%	22	14.7%
37 to 39	13	6.6%	12	25.5%	1	0.7%
40 or older	29	14.7%	29	61.7%	0	0.0%
Race						
Caucasian/White	187	94.9%	43	91.5%	144	96.0%
African American/Black	4	2.0%	0	0.0%	2	1.3%
Other	4	2.0%	2	4.3%	2	1.3%
Unknown	2	1.0%	2	4.3%	2	1.3%
Accession Source						
US Naval Academy	89	45.2%	23	48.9%	66	44.0%
ROTC Scholarship	60	30.5%	10	21.3%	50	33.3%
OCS	27	13.7%	8	17.0%	19	12.7%
ROTC Non-Scholarship	4	2.0%	1	2.1%	3	2.0%
Other	17	8.6%	5	10.6%	12	8.0%
Squadron Type						
Helicopter	82	41.6%	21	44.7%	61	40.7%
Propeller	62	31.5%	17	36.2%	45	30.0%
Jet	49	24.9%	9	19.1%	40	26.7%
Unknown	4	2.0%	0	0.0%	4	2.7%
PMOS						
Pilot	138	70.1%	30	63.8%	108	72.0%
NFO	59	29.9%	17	36.2%	42	28.0%

There were four possible commission sources: The Naval Academy, ROTC Scholarship Programs, ROTC Non-scholarship programs and Other Commissioning Sources. The primary accession source for FNAs was the Naval Academy, which produced 41.6%. ROTC scholarship programs produced another 31.5% of FNAs. OCS was the commission source for 24.9%, while 2% received a commission through another source.

FNAs were categorized by PMOS or designator. The PMOS determined whether a FNA was a pilot or naval flight officer. Of the available records, 70.1% were pilots and 29.9% were naval flight officers. Although there are many different aircraft types, the data was categorized into helicopters, propeller aircraft, jet aircraft and unknown. Most FNAs, 41.6% were helicopter pilots. Propeller aircraft claimed 31.5% of FNAs, while 24.9% flew jet aircraft. Two percent were not known.

B. ANALYSIS OF THE RETENTION DATA

An examination of the remained and attrited columns in Table 5 depicts some variation between the two groups on a number of the demographic variables. Interestingly, age, which was a stated independent variable, showed the greatest difference of all the other variables. Of the FNAs who left, 60.4%, were in their early thirties. Only 4.1% were younger than thirty when they left. Of the FNAs who remained, 14.7% were 40 or over, 14.2% were in their mid-thirties and 6.6% were in their late thirties. When considered within the framework of the data preparation, however, the age difference makes more sense. FNAs comprising the “Remained” group served 13 or more years on ADONA, whereas those comprising the “Attrited” group served 12 or fewer years on ADONA. The mean age of FNAs at service entry was 22.97 years (min: 21 years, max: 28 years, sd: 1.57 years). Given that most FNAs began their career at

approximately the same age, the higher age for the “Remained” group makes sense. Table 6 presents the descriptive statistics concerning the age distribution of each group.

Table 6. Comparative Summary Statistics of FNA Age

	Age at Commissioning	Age of Retained FNAs	Age of Attrited FNAs
Mean	22.98	40.34	31.73
Standard Error	0.11	0.46	0.14
Median	23.00	41.00	32.00
Standard Deviation	1.58	3.18	1.71

The implication of age data was that the differing age ranges between the groups was not surprising given that the assignment to “Remained” or “Attrited” was based on years of active duty service. A logistic regression of age (Appendix A) shows an extremely strong degree of statistical significance Chisquare(1) = 176.58, $p < .0001$; $\beta age = -1.22$ ($SE(\beta age) = .24$). The practical significance, however, is negligible as a result of the data preparation.

There did not appear to be any other stark contrast between demographic variables based upon the sample descriptive statistics, however there were minor differences between the groups with respect to dependents and PMOS. Greater percentages of the “Remained” group have dependents than those of the “Attrited” group. Approximately 43% of the FNAs who remained had children, whereas only roughly 27% of FNA who left had children Also, a greater percentage of pilots appear in the “Attrited” group than the “Retained” group, whereas the opposite was true for NFOs.

C. MODEL EVALUATION AND HYPOTHESIS TESTING

The hypotheses were tested in two steps. In the first step, the logistic regression model included all independent variables in the model to determine which were the strongest predictors. In the second step, a series of logistic regressions with all combinations of independent variables, were calculated. The

results of testing those models, with accompanying pertinent statistics, are displayed in Table 8. In the interest of clarity, the models in Table 7 were sorted in order of increasing probability. That is to say that the models are sorted in order of statistical significance, with the most statistically significant model appearing first. It should be noted, however, that the models were evaluated in the order stated in the "Run" column during the analysis process. The model was evaluated beginning with the full model including all five variables. Thereafter, the evaluation progressed logically, testing all combinations of the variables to determine whether any variable was influencing or masking the effects of other variables.

Table 7. Model Comparison of All Logistic Regression Models Tested

Run	Model	df	ChiSquare	Prob>ChiSq	AIC	BIC
24	D	5	16.53	0.0055	212.385	231.643
19	D P	6	17.16	0.0087	213.909	236.299
13	M D	6	16.54	0.0111	214.526	236.916
18	D S	8	19.61	0.0119	215.826	244.413
17	D A	9	21.03	0.0125	216.627	248.277
6	D A S P	13	26.40	0.0150	220.384	264.041
9	M D P	7	17.17	0.0163	216.071	241.571
11	D A P	10	21.78	0.0163	218.122	252.811
4	M D S P	10	21.73	0.0165	218.175	252.863
10	D A S	12	24.23	0.0189	220.235	260.928
8	M D S	9	7.45	0.0204	227.988	256.574
7	M D A	10	21.04	0.0208	218.861	253.549
1	M D A S P	14	26.44	0.0228	222.693	269.289
3	M D A P	11	21.79	0.0261	220.384	258.086
2	M D A S	13	24.27	0.0288	222.517	266.174
22	S P	4	7.66	0.1047	219.127	235.229
12	A S P	8	10.18	0.2523	225.256	253.842
5	M A S P	9	11.11	0.2680	226.546	258.196
27	P	1	1.11	0.2916	219.428	225.932
26	S	3	3.60	0.3082	221.088	234.012
15	M S	4	4.17	0.3832	222.620	238.722
16	M P	2	1.69	0.4287	220.908	230.634
23	M	1	0.56	0.4519	219.974	226.478
20	A S	7	6.46	0.4869	226.781	252.281
21	A P	5	3.81	0.5757	225.100	244.358
25	A	4	2.78	0.5937	224.003	240.105
14	M A	5	3.68	0.5963	225.240	244.497

Legend
M: Marital Status
D: Dependents
A: Accession source
S: Squadron type
P: PMOS

The most statistically significant model in the table was D, which represents dependents. Further, the dependents variable appeared in the first fifteen models in the table. Of the remaining four variables, none approached significance at the .05 level. The closest was the PMOS variable, which had a *p* value of .29. The Akaike's Information Criteria (AIC) and Bayesian Information Criteria generally followed suit with the *p* values. The model using dependents as the sole predictive variable had the lowest AIC and one of the lowest BIC values. Lower AIC and BIC values indicate a better model fit than higher values.

The model using dependents as the sole independent variable was further tested (Appendix A). The model showed a high degree of statistical significance, but some of the other included statistics were less impressive. Because the model was a nominal logistic type and the independent variables were mainly categorical, the R^2 value was not overly important. The misclassification rate of .21, however, revealed that the model selected the wrong ADONA status (Remained or Attrited) 21% of the time when using the Dependents variable as the sole predictor. In the parameter estimates, the most strongly significant effect was seen with three dependents (β_{dep3} =01.73, (SE β_{dep3} = 1.03,*p* =.09. Further, with the exception of one dependent, the parameter estimates showed a negative slope. This appeared to indicate that FNAs with more children were more likely to fall into the "Remain" group.

There is a cautionary note regarding the significance of the Dependents variable. Taking into consideration the problem experienced with the Age variable, the Dependents variable is subject to similar issues. Simply put, an older FNA had more time to gain additional dependents than a younger FNA (see Tables 6 and 7 to view the age difference between the "Retained" and "Attrited" groups). Therefore, it is reasonable to expect that the "Retained" group would have more dependents than the "Attrited" group. To further confirm this relationship, comparison of the two variables showed a relationship between the Age and Dependents variables at less than a .05 level (Appendix A).

Given the results presented in Table 7, there was sufficient evidence to draw some conclusions with respect to the research questions and corresponding proposed hypotheses. For clarity, the hypotheses tested the following independent variables:

H1.1: marital status

H1.2: number of dependent children

H2.1: age

H2.2: commission source

H3: squadron type

H4: designator.

Logistic regression analyses related to hypotheses H1.1, H2.2, H3 and H4 all failed to show significance at the $\alpha = .05$ level. Therefore, the null is retained for these hypotheses. For hypotheses H1.2 and H2.1, the null is rejected.

D. SUMMARY

The demographic data statistics initially revealed some interesting trends in the data. Age and number of dependents both appeared to differ between the "Retained" and "Attrited" groups. Upon further analysis, however, the data preparation involved separating the groups with respect to time. The resultant effect caused the age variable to display a statistically significant effect. Similarly, the dependents variable was found to be correlated to FNA age at a statistically significant level.

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V. DISCUSSION

A. SUMMARY

This thesis analyzed factors that affect a FNA's decision to either remain on or leave ADONA. To that end, four research questions isolated potential reasons that might drive a FNA's decision to leave ADONA. Research into previous studies indicated that personal, organization and job factors, could help to create a model which would help predict FNA attrition.

Findings from previous studies indicated that these could potentially predict a FNA's decision to leave ADONA. Within the personal factor, this study investigated the possible effect of marital status, number of dependents and commission source on FNA attrition. These three variables were based on the work of Mathews, Collins & Cobb (1974), Glass & Riley (1998), Keegan (1999) and others, which suggested that marriage and family contributed to female turnover in the workplace. Demirel (2002) and Poindexter (1998) found that commission source could affect turnover. The organizational factor was included based on the work of Keegan (1999) and Buettner (2012), who were both FNAs as well as researchers, and had personal experience with the subject of FNA turnover. Unfortunately, the organizational factor was unable to be fully tested as a result of unavailable data. The organizational factor originally consisted of four variables; only squadron type was available. The final category, job factors, was pared down from three variables to one because of data availability. Designator, the only job variable available in the DMDC database, was included based on the work of Dryfhout-Ferguson & Estes (2004), Taylor (2005) and Poindexter (1998), whose research indicated that job type could be a significant factor in turnover.

The DMDC provided the database for the study in the form of individual service record data organized by time. The database consisted of over 16,000 rows of data comprising 458 unique service records. After sanitizing the data to

remove service records which fell outside the scope of the study, 197 unique records remained. Although the DMDC database was very detailed, some information needed to test the original model was not available. Specifically, information regarding a FNA's educational background and information related to the size and gender composition of her squadron were not available. The database did, however, include enough information to test a modified version of the originally proposed model.

The logistic regression analysis of the model revealed one factor that was significant: number of dependents. Although affected by the data preparation, the age variable was also statistically significant. However, the significance of both variables was very likely a result of the lack of availability of data on FNAs after leaving ADONA. That is to say that there is no way to know how many dependents a FNA might have gained after leaving ADONA. Alternatively, the results could indicate that FNAs leave ADONA at a younger age since they believe naval aviation is inconsistent with having children. If this is true, the results would be consistent with the findings of Keegan's (1999) and Buettner's (2012) research.

B. CONCLUSIONS

This study provided evidence that at least one factor was statistically significant in predicting FNA attrition. The logistic regression model showed that a lower number of dependents actually increased the likelihood that a FNA would leave ADONA. This result was interesting in that it contradicted the findings of previous research. Keegan (1999) found that both a desire for children and actually having children could lead to an increased likelihood to leave the naval service. Buettner (2012) also found that family considerations influenced a FNA's decision toward leaving naval aviation. Considering the significance of the

age variable, however, this could be an indication that FNAs leave ADONA while still in their early thirties in order to start a family. This interpretation is consistent with the findings of Keegan (1999) and Buettner (2012).

None of the other factors examined in the model showed statistically significant results. These findings did not agree with the research of Poindexter (1998), Sinclair (2004) and others. However, much of the other research focused on different groups, different settings and had larger data sets. Poindexter, for example, looked at naval aviators as a whole, without separating FNAs. Sinclair looked at female naval officers as a whole, without focusing specifically on aviators. This indicates that FNAs may have a different value set for considering retention than the groups considered in other studies.

A primary reason behind this study's contradictory findings, however, is likely related to data availability. Without data about the FNAs who elected to leave ADONA, it was difficult to make a true comparison between the FNAs who remained and those who left. In this study, the two groups were compared irrespective of their time in service. In other words, the FNAs who left ADONA had up to twelve years of time in service. The FNAs who remained in ADONA had more than twelve years of time in service. A better comparison would have contrasted FNAs who had stayed or left based on a set period of time from their entry into ADONA status.

C. RECOMMENDATIONS

The ultimate goal of this study was to determine whether there were any factors that might help to predict why FNAs decided to leave ADONA status. However, much of the data needed to make a true comparison was not available. This is understandable, considering that the military is not focused on data collection, but rather on current and future operational concerns. One might argue, however, that failure to properly manage manpower can severely curtail the military's ability to perform its mission. Perhaps a better way to determine

why not only FNAs, but all naval service members, leave the naval service is to administer a required, comprehensive exit survey as part of the separation process.

The Navy used to conduct a continuous survey, called ARGUS, which was designed to collect information regarding a service member's opinion on quality of life issues. The program was fielded on December 11, 2006 by Vice Admiral Harvey via navy instruction 1040.10A. The ARGUS survey collected information during various key points in a service member's career, not limited to separation from service. The program only lasted four years, however, and was discontinued on March 26, 2010 for lack of participation. The issue was not with the survey itself, but rather that service members were either not told about the survey or elected not to participate.

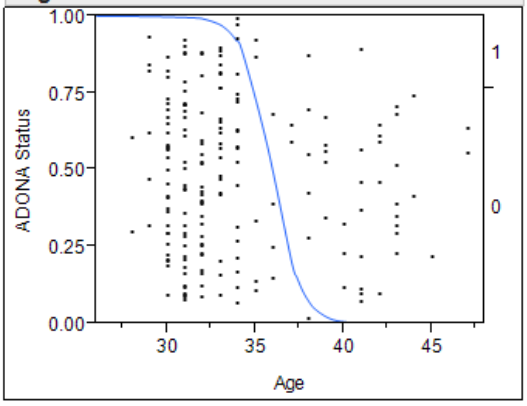
In summary, the survey was a good idea, but likely administered poorly. A survey like ARGUS, if administered properly, would provide a wealth of valuable information to the Navy. The survey could help to identify the impact of various policy decisions in a more accurately and timely manner than retrospective studies based on service record data. Further, over time the survey could be tailored to various specific groups within the services in order to obtain more pertinent data. Over time, this could reduce the cost of data collection and provide higher quality information to force planners when making policy decisions.

APPENDIX

Table 8. Logistic Model with Age as the Independent Variable

Nominal Logistic Fit for ADONA Status

Logistic Plot



Converged in Gradient, 8 iterations

Whole Model Test

Model	-LogLikelihood	DF	ChiSquare	Prob>ChiSq
Difference	88.29059	1	176.5812	<.0001*
Full	19.94831			
Reduced	108.23890			

RSquare (U)	0.8157
AICc	43.9585
BIC	50.463
Observations (or Sum Wgts)	197

Measure	Training	Definition
Entropy RSquare	0.8157	1-Loglike(model)/Loglike(0)
Generalized RSquare	0.8878	(1-(L(0)/L(model))^(2/n))/(1-L(0)^(2/n))
Mean -Log p	0.1013	$\sum$ -Log(ρ[j])/n
RMSE	0.1743	$\sqrt{\sum(y[j]-\rho[j])^2/n}$
Mean Abs Dev	0.0576	$\sum$ |y[j]-ρ[j]|/n
Misclassification Rate	0.0457	$\sum$ (ρ[j]≠ρMax)/n
N	197	n

Lack Of Fit

Source	DF	-LogLikelihood	ChiSquare
Lack Of Fit	17	3.343460	6.686919
Saturated	18	16.604850	Prob>ChiSq
Fitted	1	19.948310	0.9873

Parameter Estimates

Term	Estimate	Std Error	ChiSquare	Prob>ChiSq
Intercept	43.6927942	8.3584292	27.33	<.0001*
Age	-1.2163575	0.2390552	25.89	<.0001*

For log odds of 0/1

Effect Likelihood Ratio Tests

Source	Nparm	DF	L-R ChiSquare	Prob>ChiSq
Age	1	1	176.581186	<.0001*

Table 9. Logistic Model with Number of Dependent Children as the Independent Variable

Nominal Logistic Fit for ADONA Status

Converged in Gradient, 14 iterations

Whole Model Test

Model	-LogLikelihood	DF	ChiSquare	Prob>ChiSq
Difference	8.26725	5	16.5345	0.0055*
Full	99.97165			
Reduced	108.23890			

RSquare (U)	0.0764
AICc	212.385
BIC	231.643
Observations (or Sum Wgts)	197

Measure	Training	Definition
Entropy RSquare	0.0764	1-Loglike(model)/Loglike(0)
Generalized RSquare	0.1207	(1-(L(0)/L(model))^(2/n))/(1-L(0)^(2/n))
Mean -Log p	0.5075	$\sum$ -Log(ρ[j])/n
RMSE	0.4045	$\sqrt{\sum(y[j]-\rho[j])^2/n}$
Mean Abs Dev	0.3272	$\sum$ |y[j]-ρ[j]|/n
Misclassification Rate	0.2081	$\sum$ (ρ[j]≠ρMax)/n
N	197	n

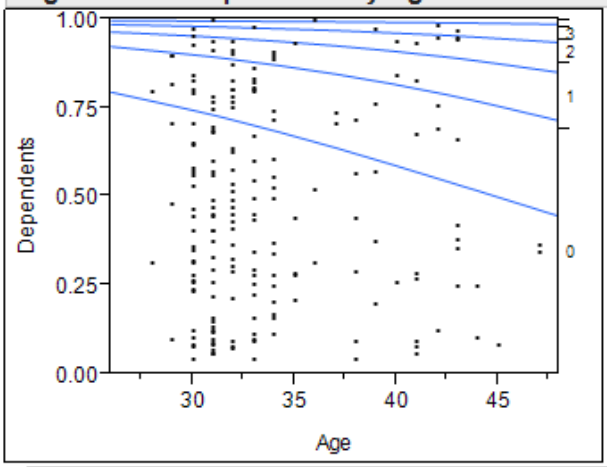
Parameter Estimates

Term		Estimate	Std Error	ChiSquare	Prob>ChiSq
Intercept		1.39551102	0.2149683	42.14	<.0001*
Dependents[1-0]		0.02587466	0.4728121	0.00	0.9564
Dependents[2-1]		-0.6104555	0.7337922	0.69	0.4055
Dependents[3-2]		-1.7272209	1.0301025	2.81	0.0936
Dependents[4-3]		-0.1823216	1.42595	0.02	0.8983
Dependents[5-4]	Unstable	-14.104282	2001.0906	0.00	0.9944

For log odds of 0/1

Table 10. Logistic Comparison of Dependents by Age

Logistic Fit of Dependents By Age



Whole Model Test

Model	-LogLikelihood	DF	ChiSquare	Prob>ChiSq
Difference	2.02290	1	4.045796	0.0443*
Full	189.12960			
Reduced	191.15250			

RSquare (U)	0.0106
AICc	390.701
BIC	409.958
Observations (or Sum Wgts)	197

Measure	Training	Definition
Entropy RSquare	0.0106	1-Loglike(model)/Loglike(0)
Generalized RSquare	0.0237	(1-(L(0)/L(model))^(2/n))/(1-L(0)^(2/n))
Mean -Log p	0.9600	$\sum$ -Log(ρ[j])/n
RMSE	0.5525	$\sqrt{\sum(y[j]-\rho[j])^2/n}$
Mean Abs Dev	0.4828	$\sum$ |y[j]-ρ[j]|/n
Misclassification Rate	0.3096	$\sum$ (ρ[j]≠ρMax)/n
N	197	n

Parameter Estimates

Term	Estimate	Std Error	ChiSquare	Prob>ChiSq
Intercept[0]	3.22109083	1.1679152	7.61	0.0058*
Intercept[1]	4.35830755	1.189694	13.42	0.0002*
Intercept[2]	5.18127191	1.2126316	18.26	<.0001*
Intercept[3]	6.11062558	1.2626889	23.42	<.0001*
Intercept[4]	7.74832855	1.5485702	25.04	<.0001*
Age	-0.0716428	0.0338099	4.49	0.0341*

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